

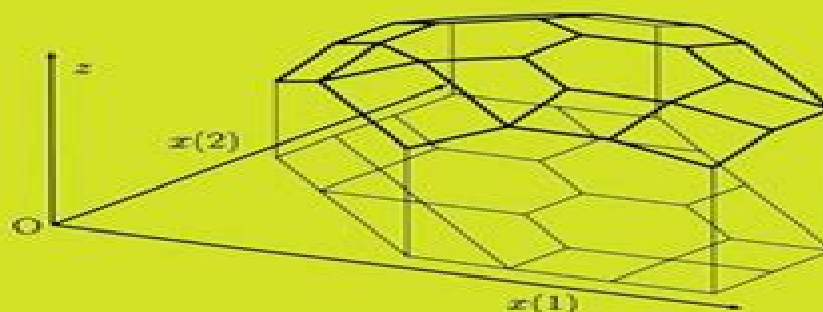


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Submodular Functions and Optimization

Second Edition



SATORU FUJISHIGE

Submodular Functions And Optimization 2nd Ed

Vangelis Th. Paschos



Submodular Functions And Optimization 2nd Ed:

Submodular Functions and Optimization Satoru Fujishige, 2005-07-26 It has widely been recognized that submodular functions play essential roles in efficiently solvable combinatorial optimization problems Since the publication of the 1st edition of this book fifteen years ago submodular functions have been showing further increasing importance in optimization combinatorics discrete mathematics algorithmic computer science and algorithmic economics and there have been made remarkable developments of theory and algorithms in submodular functions The 2nd edition of the book supplements the 1st edition with a lot of remarks and with new two chapters Submodular Function Minimization and Discrete Convex Analysis The present 2nd edition is still a unique book on submodular functions which is essential to students and researchers interested in combinatorial optimization discrete mathematics and discrete algorithms in the fields of mathematics operations research computer science and economics Self contained exposition of the theory of submodular functions Selected up to date materials substantial to future developments Polyhedral description of Discrete Convex Analysis Full description of submodular function minimization algorithms Effective insertion of figures Useful in applied mathematics operations research computer science and economics *Submodular Functions and Optimization* S. Fujishige, 1991-01-24 The importance of submodular functions has been widely recognized in recent years in combinatorial optimization This is the first book devoted to the exposition of the theory of submodular functions from an elementary technical level to an advanced one A unifying view of the theory is shown by means of base polyhedra and duality for submodular and supermodular systems Among the subjects treated are neoflows submodular flows independent flows polymatroidal flows submodular analysis submodular programs duality Lagrangian functions principal partitions nonlinear optimization with submodular constraints lexicographically optimal bases fair resource allocation Special emphasis is placed on the constructive aspects of the theory which lead to practical efficient algorithms **Iterative Methods in Combinatorial Optimization** Lap Chi Lau, R. Ravi, Mohit Singh, 2011-04-18 With the advent of approximation algorithms for NP hard combinatorial optimization problems several techniques from exact optimization such as the primal dual method have proven their staying power and versatility This book describes a simple and powerful method that is iterative in essence and similarly useful in a variety of settings for exact and approximate optimization The authors highlight the commonality and uses of this method to prove a variety of classical polyhedral results on matchings trees matroids and flows The presentation style is elementary enough to be accessible to anyone with exposure to basic linear algebra and graph theory making the book suitable for introductory courses in combinatorial optimization at the upper undergraduate and beginning graduate levels Discussions of advanced applications illustrate their potential for future application in research in approximation algorithms [Integer Programming and Combinatorial Optimization](#) Quentin Louveaux, Martin Skutella, 2016-05-25 This book constitutes the refereed proceedings of the 18th International Conference on Integer Programming and Combinatorial Optimization IPCO 2016 held

in Liège Belgium in June 2016 The 33 full papers presented were carefully reviewed and selected from 125 submissions The conference is a forum for researchers and practitioners working on various aspects of integer programming and combinatorial optimization The aim is to present recent developments in theory computation and applications in these areas The scope of IPCO is viewed in a broad sense to include algorithmic and structural results in integer programming and combinatorial optimization as well as revealing computational studies and novel applications of discrete optimization to practical problems

Mathematical Game Theory Ulrich Faigle, 2022-02-25 What is a game Classically a game is perceived as something played by human beings Its mathematical analysis is human centered explores the structures of particular games economic or social environments and tries to model supposedly rational human behavior in search of appropriate winning strategies This point of view places game theory into a very special scientific corner where mathematics economics and psychology overlap and mingle This book takes a novel approach to the subject Its focus is on mathematical models that apply to game theory in particular but exhibit a universal character and thus extend the scope of game theory considerably This textbook addresses anyone interested in a general game theoretic view of the world The reader should have mathematical knowledge at the level of a first course in real analysis and linear algebra However possibly more specialized aspects are further elaborated and pointers to relevant supplementary literature are given Moreover many examples invite the reader to participate actively when going through the material The scope of the book can be covered in one course on Mathematical Game Theory at advanced undergraduate or graduate level

Mathematical Foundations of Computer Science 2009 Rastislav Kráľovic, Damian Niwinski, 2009-08-19 This book constitutes the refereed proceedings of the 34th International Symposium on Mathematical Foundations of Computer Science MFCS 2009 held in Nový Smokovec High Tatras Slovakia in August 2009 The 56 revised full papers presented together with 7 invited lectures were carefully reviewed and selected from 148 submissions All current aspects in theoretical computer science and its mathematical foundations are addressed including algorithmic game theory algorithmic learning theory algorithms and data structures automata grammars and formal languages bioinformatics complexity computational geometry computer assisted reasoning concurrency theory cryptography and security databases and knowledge based systems formal specifications and program development foundations of computing logic in computer science mobile computing models of computation networks parallel and distributed computing quantum computing semantics and verification of programs theoretical issues in artificial intelligence

Digraphs Jørgen Bang-Jensen, Gregory Z. Gutin, 2008-12-17 Substantially revised reorganised and updated the second edition now comprises eighteen chapters carefully arranged in a straightforward and logical manner with many new results and open problems As well as covering the theoretical aspects of the subject with detailed proofs of many important results the authors present a number of algorithms and whole chapters are devoted to topics such as branchings feedback arc and vertex sets connectivity augmentations sparse subdigraphs with prescribed connectivity and also packing

covering and decompositions of digraphs Throughout the book there is a strong focus on applications which include quantum mechanics bioinformatics embedded computing and the travelling salesman problem Detailed indices and topic oriented chapters ease navigation and more than 650 exercises 170 figures and 150 open problems are included to help immerse the reader in all aspects of the subject Applications of Combinatorial Optimization, Volume 3 Vangelis Th.

Paschos,2013-02-07 Combinatorial optimization is a multidisciplinary scientific area lying in the interface of three major scientific domains mathematics theoretical computer science and management The three volumes of the Combinatorial Optimization series aims to cover a wide range of topics in this area These topics also deal with fundamental notions and approaches as with several classical applications of combinatorial optimization Applications of Combinatorial Optimization is presenting a certain number among the most common and well known applications of Combinatorial Optimization

Principles and Practice of Constraint Programming - CP 2007 Christian Bessiere,2007-10-11 This book constitutes the refereed proceedings of the 13th International Conference on Principles and Practice of Constraint Programming CP 2007 It contains 51 revised full papers and 14 revised short papers presented together with eight application papers and the abstracts of two invited lectures All current issues of computing with constraints are addressed ranging from methodological and foundational aspects to solving real world problems in various application fields **Matrices and Matroids for**

Systems Analysis Kazuo Murota,2009-10-27 A matroid is an abstract mathematical structure that captures combinatorial properties of matrices This book offers a unique introduction to matroid theory emphasizing motivations from matrix theory and applications to systems analysis This book serves also as a comprehensive presentation of the theory and application of mixed matrices developed primarily by the present author in the 1990 s A mixed matrix is a convenient mathematical tool for systems analysis compatible with the physical observation that fixed constants and system parameters are to be distinguished in the description of engineering systems This book will be extremely useful to graduate students and researchers in engineering mathematics and computer science From the reviews The book has been prepared very carefully contains a lot of interesting results and is highly recommended for graduate and postgraduate students Andr s Recski Mathematical Reviews Clippings 2000m 93006

Submodular Rate Region Models for Multicast Communication in Wireless Networks Maximilian Riemensberger,2017-08-29 This book proposes representations of multicast rate regions in wireless networks based on the mathematical concept of submodular functions e g the submodular cut model and the polymatroid broadcast model These models subsume and generalize the graph and hypergraph models The submodular structure facilitates a dual decomposition approach to network utility maximization problems which exploits the greedy algorithm for linear programming on submodular polyhedra This approach yields computationally efficient characterizations of inner and outer bounds on the multicast capacity regions for various classes of wireless networks **Integer**

Programming and Combinatorial Optimization Matteo Fischetti,David P. Williamson,2007-06-26 This book constitutes

the refereed proceedings of the 12th International Conference on Integer Programming and Combinatorial Optimization IPCO 2007 held in Ithaca NY USA in June 2007 Among the topics addressed in the 36 revised full papers are approximation algorithms algorithmic game theory computational biology integer programming polyhedral combinatorics scheduling theory and scheduling algorithms as well as semidefinite programs

Research Trends in Combinatorial Optimization William J. Cook, László Lovász, Jens Vygen, 2008-11-07 The editors and authors dedicate this book to Bernhard Korte on the occasion of his seventieth birthday We the editors are happy about the overwhelming feedback to our initiative to honor him with this book and with a workshop in Bonn on November 3-7 2008 Although this would be a reason to look back we would rather like to look forward and see what are the interesting research directions today This book is written by leading experts in combinatorial optimization All papers were carefully reviewed and eventually twenty three of the invited papers were accepted for this book The breadth of topics is typical for the field combinatorial optimization builds bridges between areas like combinatorics and graph theory submodular functions and matroids network flows and connectivity approximation algorithms and mathematical programming computational geometry and polyhedral combinatorics All these topics are related and they are all addressed in this book Combinatorial optimization is also known for its numerous applications To limit the scope however this book is not primarily about applications although some are mentioned at various places Most papers in this volume are surveys that provide an excellent overview of an active research area but this book also contains many new results Highlighting many of the currently most interesting research directions in combinatorial optimization we hope that this book constitutes a good basis for future research in these areas

Applications of Combinatorial Optimization Vangelis Th. Paschos, 2014-09-15

Combinatorial optimization is a multidisciplinary scientific area lying in the interface of three major scientific domains mathematics theoretical computer science and management The three volumes of the Combinatorial Optimization series aim to cover a wide range of topics in this area These topics also deal with fundamental notions and approaches as with several classical applications of combinatorial optimization Concepts of Combinatorial Optimization is divided into three parts On the complexity of combinatorial optimization problems presenting basics about worst case and randomized complexity Classical solution methods presenting the two most known methods for solving hard combinatorial optimization problems that are Branch and Bound and Dynamic Programming Elements from mathematical programming presenting fundamentals from mathematical programming based methods that are in the heart of Operations Research since the origins of this field

Principles and Practice of Constraint Programming - CP 2005 Peter van Beek, 2005-10-19 The 11th International Conference on the Principles and Practice of Constraint Programming CP 2005 was held in Sitges Barcelona Spain October 1-5 2005 Information about the conference can be found on the web at <http://www.iia.csic.es/cp2005> Information about past conferences in the series can be found at <http://www.cs.ualberta.ca/ai/cp/> The CP conference series is the premier international conference on constraint programming and is held annually The conference is concerned with all aspects

of computing with constraints including algorithms applications environments languages models and systems This year we received 164 submissions All of the submitted papers received atleastthreereviews andthepapersandtheirreviewswerethenextensivelydiscussed during an online Program Committee meeting As a result the Program Committee chose 48 29 3% papers to be published in full in the proceedings and a further 22 13 4% papers to be published as short papers The full papers were presented at the conference in two parallel tracks and the short papers were presented as posters during a lively evening session Two papers were selected by a subcommittee of the Program Committee consisting of Chris Beck Gilles Pesant and myself to receive best paper awards The conference program also included excellent invited talks by Hector Ge n er Ian Horrocks Francesca Rossi and Peter J Stuckey As a permanent record the proceedings contain four page extended abstracts of the invited talks

Combinatorial Optimization A. Ridha Mahjoub, Vangelis Markakis, Ioannis Milis, Vangelis Th. Paschos, 2012-07-05 This book constitutes the thoroughly refereed post conference proceedings of the Second International Symposium on Combinatorial Optimization ISCO 2012 held in Athens Greece in April 2012 The 37 revised full papers presented together with 4 invited talks were carefully reviewed and selected from 94 regular and 30 short submissions They present original research on all aspects of combinatorial optimization ranging from mathematical foundations and theory of algorithms to computational studies and practical applications

Combinatorial Optimization Bernhard Korte, Jens Vygen, 2012-01-10 This comprehensive textbook on combinatorial optimization places special emphasis on theoretical results and algorithms with provably good performance in contrast to heuristics It is based on numerous courses on combinatorial optimization and specialized topics mostly at graduate level This book reviews the fundamentals covers the classical topics paths flows matching matroids NP completeness approximation algorithms in detail and proceeds to advanced and recent topics some of which have not appeared in a textbook before Throughout it contains complete but concise proofs and also provides numerous exercises and references This fifth edition has again been updated revised and significantly extended with more than 60 new exercises and new material on various topics including Cayley's formula blocking flows faster b matching separation multidimensional knapsack multicommodity max flow min cut ratio and sparsest cut Thus this book represents the state of the art of combinatorial optimization

Set Functions, Games and Capacities in Decision Making Michel Grabisch, 2016-06-15 The book provides a thorough treatment of set functions games and capacities as well as integrals with respect to capacities and games in a mathematical rigorous presentation and in view of application to decision making After a short chapter introducing some required basic knowledge linear programming polyhedra ordered sets and notation the first part of the book consists of three long chapters developing the mathematical aspects This part is not related to a particular application field and by its neutral mathematical style is useful to the widest audience It gathers many results and notions which are scattered in the literature of various domains game theory decision combinatorial optimization and operations research The

second part consists of three chapters applying the previous notions in decision making and modelling decision under uncertainty decision with multiple criteria possibility theory and Dempster Shafer theory **Discrete Optimization and Operations Research** Yury Kochetov, Michael Khachay, Vladimir Beresnev, Evgeni Nurminski, Panos Pardalos, 2016-09-09 This book constitutes the proceedings of the 9th International Conference on Discrete Optimization and Operations Research DOOR 2016 held in Vladivostok Russia in September 2016 The 39 full papers presented in this volume were carefully reviewed and selected from 181 submissions They were organized in topical sections named discrete optimization scheduling problems facility location mathematical programming mathematical economics and games applications of operational research and short communications *Discrete Convex Analysis* Kazuo Murota, 2003-01-01 Discrete Convex Analysis is a novel paradigm for discrete optimization that combines the ideas in continuous optimization convex analysis and combinatorial optimization matroid submodular function theory to establish a unified theoretical framework for nonlinear discrete optimization The study of this theory is expanding with the development of efficient algorithms and applications to a number of diverse disciplines like matrix theory operations research and economics This self contained book is designed to provide a novel insight into optimization on discrete structures and should reveal unexpected links among different disciplines It is the first and only English language monograph on the theory and applications of discrete convex analysis

Reviewing **Submodular Functions And Optimization 2nd Ed**: Unlocking the Spellbinding Force of Linguistics

In a fast-paced world fueled by information and interconnectivity, the spellbinding force of linguistics has acquired newfound prominence. Its capacity to evoke emotions, stimulate contemplation, and stimulate metamorphosis is truly astonishing. Within the pages of "**Submodular Functions And Optimization 2nd Ed**," an enthralling opus penned by a very acclaimed wordsmith, readers set about an immersive expedition to unravel the intricate significance of language and its indelible imprint on our lives. Throughout this assessment, we shall delve to the book is central motifs, appraise its distinctive narrative style, and gauge its overarching influence on the minds of its readers.

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